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PLANETARY PHENOMENA FOR NOVEMBER AND DECEMBER, 1912.

BY MALCOLM McNEILL.

PHASES OF THE MOON, PACIFIC TIME.

Last Quarter .. Nov. 1, 7 ^h 38 ^m P.M.	Last Quarter .. Dec. 1, 3 ^h 5 ^m A.M.
New Moon " 8, 6 5 P.M.	New Moon ... " 8, 9 7 P.M.
First Quarter.. " 16, 2 43 P.M.	First Quarter.. " 16, 12 6 P.M.
Full Moon " 24, 8 12 A.M.	Full Moon " 23, 8 30 P.M.
	Last Quarter.. " 30, 12 12 P.M.

The Sun reaches the winter solstice December 21st, 8 P. M., Pacific time.

The Earth reaches perihelion December 31st, 5 P. M., Pacific time.

Mercury is an evening star on November 1st, reaches greatest east elongation on November 19th, passes inferior conjunction and becomes a morning star on December 8th, and comes to greatest west elongation on December 28th. Both the eastern and western elongations are of average size, a little more than 22° , but the conditions for visibility are much more favorable for visibility during the latter half of December as a morning star than they are during November as an evening star. At the time of greatest east elongation, November 19th, the planet sets only a little more than an hour after sunset, and the interval is less than an hour, except for a few days near the middle of the month. The time between greatest elongation and conjunction is much less than the average, as perihelion passage occurs on the same date and only three hours before conjunction. At the time of east elongation the planet is south of the Sun and at the time of greatest west elongation the planet is north of the Sun. By the middle of December *Mercury* is in favorable position for observation in the morning twilight, rising an hour and twenty minutes before sunrise, and at the end of the month the interval is nearly an hour and three quarters. During the two months' period *Mercury* is twice in conjunction with *Jupiter*, the first time on the evening of November 20th, when it passes $2^\circ 47'$ south of the latter, and

again on the night of December 2d, when it passes $0^{\circ} 35'$ to the south. Also after it passes the Sun and becomes a morning star it comes to conjunction with *Mars* on December 14th, passing about 3° north.

Venus is an evening star and rapidly increases its distance from the Sun. On November 1st it remains above the horizon about an hour and one half after sunset, on December 1st about two and one-half hours, and on December 31st nearly three and one-half hours. A considerable part of this increase is due to the fact that *Venus* is moving faster northward than the Sun. At the end of December the planet lacks about 6° of its greatest east elongation. *Venus* is in conjunction with *Jupiter* on the evening of November 7th, passing $1^{\circ} 43'$ south of the latter, and on December 13th it passes about the same distance south of *Uranus*. It reaches on December 4th the part of its orbit farthest below the plane of the Earth's orbit. It also passed its aphelion on November 11th. As the orbit is very nearly circular, differing greatly from the orbits of *Mercury* and *Mars* in this respect, the planet's position with regard to aphelion or perihelion makes little difference in its position as seen from the Earth.

Mars passes conjunction with the Sun on November 4th, and becomes a morning star, moving on toward its next opposition, but will not reach it for more than a year, the time being January 5, 1914. It does not get very far away from the Sun during the two months, rising about forty minutes before sunrise on December 1st and only a little over an hour earlier on December 31st. This will make it very difficult for naked-eye observation, although it has begun to be perceptibly brighter than it was in the autumn. During the two months its distance from the Earth will diminish about fifteen million miles and it will be fifty per cent brighter than it was at the time of its greatest distance from the Earth in early October. Its brightness depends both on its distance from the Earth and on its distance from the Sun, and it began to diminish its distance from the Sun in June.

Jupiter remains an evening star until December 18th, when it passes conjunction with the Sun and becomes a morning

star. On November 1st it sets about two hours after sunset, on December 1st not quite an hour after, and on December 31st it rises about forty minutes before sunrise. It will therefore not be an easy object in December, but it can probably be seen without difficulty in the evening twilight until about December 1st. Its conjunctions with *Venus* and *Mercury* have been noted.

The present period is very good for observations of *Saturn*, as the planet comes to opposition with the Sun on the night of November 22d, and is above the horizon nearly the whole night throughout the entire period. It is still in the constellation *Taurus*, and moves westward about 5° . At the end of December it is about 5° south of the *Pleiades*. It is then a full magnitude brighter than the average first magnitude star. The red star *Aldebaran*, α *Tauri*, about 10° east of *Saturn*, is very nearly a standard first magnitude.

Uranus is in the western sky in the evening, setting about 10 P. M. on November 1st and at about 6:30 on December 31st. It moves about 2° eastward during the month toward a point a little north of the two fifth-magnitude stars π and ρ *Capricorni*. Its conjunction with *Venus* on December 13th has already been mentioned. *Venus* will pass $1^{\circ} 36'$, about three Moon's diameters, south of *Uranus*.

Neptune rises at about 10 P. M. on November 1st and at about 6 P. M. on December 31st. It is moving slowly westward in *Gemini*.